

**Notice of Allowability**

Application No.

10/632,283

Examiner

Tiffany A. Fetzner

Applicant(s)

SABATE ET AL.

Art Unit

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**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/15/2004 & telephonic interview of 3/16/2005.
2. ☒ The allowed claim(s) is/are 1,3-9,11-16 and 18-24.
3. ☒ The drawings filed on 1/02/04 figs 1-7 & 12/15/05 figs 8a,8b are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☒ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☒ hereto or 2) ☐ to Paper No./Mail Date 03/16/2005.
    - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 03/17/2005.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 03/17/2005.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### **Examiner's Amendment**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Patrick S. Yoder Reg. No. 37,479** on March 16<sup>th</sup> 2005 along with authorization to charge any necessary fees to applicant's deposit account.
3. The application has been amended as follows:

**A) Replace claim 1** of the December 15<sup>th</sup> 2004 amendment with the following  
**Examiner amended claim 1:**

**Claim 1** --- A method of operating a **magnetic resonance imaging (MRI)** system having a **gradient** coil, said method comprising:

providing a switched amplified current to the **gradient** coil from a switched amplifier via a first inductor; and

providing a second current to the **gradient** coil via a second inductor, wherein the first inductor is coupled to the second inductor via a transformer **with** the switched amplified current and the second current **being** substantially out of phase and wherein the switched amplified current and the second current are obtained from the switched amplifier. ---

**B) Replace claim 4** of the December 15<sup>th</sup> 2004 amendment with the following  
**Examiner amended claim 4:**

**Claim 4** --- A method in accordance with **Claim 1** further comprising coupling the first inductor with the second inductor via a transformer wherein the second inductor is connected to a first end of a secondary side of the transformer and a first side of a capacitor is connected to a second end of the secondary side **of the transformer**. ---

**C) Replace claim 5 of the December 15<sup>th</sup> 2004 amendment with the following Examiner amended claim 5:**

**Claim 5**--- A method in accordance with **Claim 4** further comprising connecting a second side of the capacitor to an end of the **gradient** coil opposite the first inductor and second inductor. ---

**D) Replace claim 6 of the December 15<sup>th</sup> 2004 amendment with the following Examiner amended claim 6:**

**Claim 6** --- A method in accordance with **Claim 5** further comprising connecting a second capacitor between the first inductor and second inductor and the end of the **gradient** coil opposite the first inductor and second inductor. ---

**E) Replace claim 7 of the December 15<sup>th</sup> 2004 amendment with the following Examiner amended claim 7:**

**Claim 7** --- A method in accordance with **Claim 4** further comprising:

connecting a first inductor to the **gradient** coil such that the switched amplified current is received from the first inductor, wherein the first inductor has an inductance  $L_p$ ; and

connecting a second inductor to the **gradient** coil such that the second current is received from the second inductor, wherein the second inductor has an inductance  $L_{aux}$ , wherein  $L_{aux} / L_p = (n-1) / n^2$ , where  $n$  is a number of primary turns of the transformer divided by a number of secondary turns of the transformer. ---

**F) Replace claim 8 of the December 15<sup>th</sup> 2004 amendment with the following Examiner amended claim 8:**

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**Claim 8** --- A method in accordance with **Claim 6** further comprising:

connecting a first inductor to the **gradient** coil such that the switched amplified current is received from the first inductor, wherein the first inductor has an inductance  $L_p$ ; and

connecting a second inductor to the **gradient** coil such that the second current is received from the second inductor, wherein the second inductor has an inductance  $L_{aux}$ , wherein  $[(\omega^2)(C_{aux})(L_{aux})-1] / [(\omega^2)(C_{aux})(L_p)] = (n-1) / n^2$ , where  $n$  is a number of primary turns of the transformer divided by a number of secondary turns of the transformer,  $C_{aux}$  is a capacitance of the capacitor connected to the second end of the secondary side, and  $\omega$  is an angular frequency. ---

**G) Replace new claim 23** of the December 15<sup>th</sup> 2004 amendment with the following **Examiner amended claim 23**:

**Claim 23** --- A gradient coil system, comprising:

a capacitor having a first side and a second side;

at least one gradient coil comprising a first end and a second end;

a first inductor connected to a first output end of a switched amplifier and connected to the first end of the gradient coil thereby providing a switched amplified current from the switched amplifier to the gradient coil;

a second inductor connected to the first end of the gradient coil thereby providing a second current to the gradient coil, wherein the second current is substantially out of phase with the switched amplified current; and

a transformer electrically coupling the first inductor with the second inductor, the transformer further comprising:

a primary side and a secondary side, wherein the primary side of the transformer is connected across the first inductor and wherein the first side of the capacitor is connected to a second side of the secondary side of the transformer and the second side of the capacitor is connected to a second output end of the switched amplifier.---

**In the original specification**

H) On page 7, paragraph [0025] line 4 **delete** "figure 20" and **insert** "figure 2".

I) **Replace the current title with:**

**Method / System for Switched Frequency Ripple Reduction in MRI Gradient Coils**

The following is an examiner's statement of **Reasons for Allowance**

4. With respect to **examiner amended claims 1, 4-8 and examiner amended new claim 23**, which is the **amended version of new claim 23** presented with the December 15<sup>th</sup> 2004 amendment that is the corresponding apparatus version of **examiner amended claim 1** these claims are considered to be allowable over the **prior art of record** by the examiner because the **prior art of record** does not disclose or suggest an MRI system method / gradient coil comprising the feature of having "**the first inductor coupled to the second inductor via a transformer,**" in combination with each of the remaining limitations in each of the examiner amended claims as currently set forth in the examiner's amendment above. It is **the combination of the claim limitations taken as a whole together that constitutes both the novelty and non-obviousness of applicant's claims.**

5. With respect to the December 15<sup>th</sup> 2004 **amended independent claims 9, 16 and dependent claims 11-15, 18-22 which depend from December 15<sup>th</sup> 2004 amended independent claims 9 and 16** respectively, these claims are considered to be allowable over the **prior art of record** by the examiner because the prior art of record does not disclose or suggest an MRI system method / gradient coil comprising the feature of having "**a transformer coupling the first inductor with the second inductor,**" in combination with each of the remaining limitations in each of the **amended claims** as currently set forth in the **December 15<sup>th</sup> 2004 amendment and response. It is the combination of the claim limitations taken as a whole together that constitutes both the novelty and non-obviousness of applicant's claims.**

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6. The examiner agrees with applicant's arguments in the December 15<sup>th</sup> 2004 amendment and response that the **Takano et al.**, reference fails to teach a Magnetic resonance gradient coil system / method wherein "a transformer couples the first inductor with the second inductor". [See applicant's arguments in the December 15<sup>th</sup> 2004 amendment and response.]

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### **Examiner's Comment**

8. **Claims 2, 3, 10 and 17** are canceled as per applicant's December 15<sup>th</sup> 2004 amendment and response.

9. The amendment of December 15<sup>th</sup> 2004 raised the issue of a possible election of species requirement , since the scope of the originally presented claims was altered by the amendments to **claim 1** and **new claim 23** of the December 15<sup>th</sup> 2004 response. However, the alteration (i.e. the removal of the "substantially no switching frequency ripple") which is a part of **amended claim 9** and **amended claim 16** amounts to the removal of an intrinsic effect that is the natural result of the structural components being arranged as recited, therefore the lack of a statement of the effectual result does not change the scope of **examiner amended claims 1** or **examiner amended claim 23**, since the **examiner amended claims 1** and **23** clarify that the method and gradient coil system are drawn to a magnetic resonance imaging gradient coil operating method / system configuration, which has been broadly interpreted by the examiner to be both structurally equivalent and method wise consistent. Therefore, the amended claims of December 15<sup>th</sup> 2004 in combination with the examiner's amendment above resolves the potential issue of an election of species because in combination with the entered examiner's amendment the election of species concern is no longer an issue.

### ***Drawings***

10. The drawings objections from the last Office Action of September 10<sup>th</sup> 2004 are rescinded in view of the corrections to the specification submitted December 15<sup>th</sup> 2004 in combination with corrected figures **8a** and **8b**.

11. A New set of corrected drawings are required in this application because the official draftsman has objected to the drawings submitted for **figures 1-7** from January 2<sup>nd</sup> 2004, and the corrected figures of **8a** and **8b** from December 15<sup>th</sup> 2004. A **complete set of NEW FORMAL DRAWINGS** including any and all examiner approved drawing changes, that have occurred during this examination are now required. [See the attached PTO 948 form of the Official Draftsman's Review.]

12. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

### **Prior Art of Record**

**A) Takano et al.**, US patent 5,721,490 issued February 24<sup>th</sup> 1998. The examiner agrees with applicant's arguments in the December 15<sup>th</sup> 2004 response that this reference fails to teach suggest or show a magnetic resonance system / gradient coil with a transformer coupling the first inductor with the second inductor, in combination with each of the other features as those found in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

**B) Stanley** US patent application publication 2005/0017695 A1 published January 27<sup>th</sup> 2005, filed July 24<sup>th</sup> 2003. This reference lacks teaching or showing the presence of a gradient coil as set forth in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

**C) Stanley** US patent application publication 2005/0017699 A1 published January 27<sup>th</sup> 2005, filed July 24<sup>th</sup> 2003. This reference lacks teaching or showing the presence of a gradient coil as set forth in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

**D) Wirth et al.**, US patent 5,270,657 issued December 14<sup>th</sup> 1993. This reference fails to teach suggest or show a magnetic resonance system / gradient coil with a

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transformer coupling the first inductor with the second inductor, in combination with each of the other features as those found in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

**E) Goff** US patent 5,081,409 issued January 14th 1992. This reference fails to teach suggest or show a magnetic resonance system / gradient coil with a transformer coupling the first inductor with the second inductor, in combination with each of the other features as those found in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

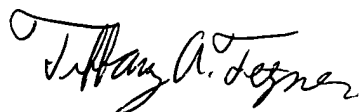
**F) Hardy et al.**, US patent 5,027,071 issued January 25th 1991. This reference fails to teach suggest or show a magnetic resonance system / gradient coil with a transformer coupling the first inductor with the second inductor, in combination with each of the other features as those found in **amended Independent claims 9, and 16** of the December 15<sup>th</sup> 2004 amendment.

**G) Sabate et al.**, US patent application publication 2005/0024056 A1 published February 3<sup>rd</sup> 2005, filed August 1<sup>st</sup> 2003. This reference is the corresponding publication of applicant's instant application and is therefore not available as prior art against the currently pending claims. The examiner has noted this reference for the purposes of a complete record only.


### Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

14. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF  
March 17, 2005

  
Diego Gutierrez  
Supervisory Patent Examiner  
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